

Case Studies in Admittance Spectroscopy

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Admittance Spectroscopy (AS) is a widely used technique to identify defects in semiconductor devices. The AS technique can determine the energy level, trap density, and cross section of a trap. The goal of the project is to develop a RAPPTURE tool on nanoHUB.org. The AS tool will help us to create a series of case studies which will illustrate how to analyze admittance spectroscopy data, supply users with a more efficient way to do AS analysis, and provide an easy solution to perform AS analysis with their own experimental data. For one of the case studies, we simulated an N⁺P junction using Solar Cell Capacitance Simulator (SCAPS) with and without a trap in the absorber to provide data to perform AS analysis. Afterwards, we found the defect energy level and capture cross section may be reliably extracted, but not the defect density. This case study demonstrates the basic procedure of AS analysis. In the future, we hope to add more case studies to exhibit the effects of different structures. For example, a current voltage and temperature (I-V-T) analysis section may help distinguish a trap and a Schottky barrier at back contact.